UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/702,162	11/05/2003	Christopher B. Rider	85055MSS	7309

7590 10/31/2007

Milton S. Sales
Patent Legal Staff
Eastman Kodak Company
343 State Street
Rochester, NY 14650-2201

EXAMINER	
TRINH, THANH TRUC	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
10/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/702,162	RIDER, CHRISTOPHER B.	
	Examiner	Art Unit	
	Thanh-Truc Trinh	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9,10 and 12-22* is/are pending in the application.

4a) Of the above claim(s) *17-22* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9,10 and 12-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1, 5 and 9-10 and 12-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Chalmers (US Patent 4379202).

Regarding claim 1, as seen in Figures 2 and 3, Chalmers discloses a photovoltaic device, comprising a photovoltaic conversion layer of n-type material (28) and p-type silicon (26); a first electrode (24) arranged on a first surface of the photovoltaic conversion layer; a second electrode (34) comprising one or more conductive tracks arranged on the opposite second surface of the photovoltaic conversion layer to receive generated photoelectrons from the photovoltaic conversion layer; and a light concentrator (38) adjacent to the second electrode wherein the one or more conductive tracks are arranged in registration with the light concentrator such that incident light is guided substantially through gaps between the one or more conductive tracks. (See Figure 3 and the light paths depicted on Figure 3). The light concentrator (38) comprises a transparent support layer (44) having light concentrating units arranged thereon, and the units are incorporating diffractive structures. (See Figures 2-5, col. 3 lines 64-68 and col. 4 lines 29-38). It is the Examiner's position that a similarly shaped segment (or a repeated pattern) of the concentrator (34) is a concentrating unit.

As seen in Figures 2-5, the light rays 32a are bent around conductive tracks (34) as passing through the concentrator (38), therefore it is the Examiner's position that the light concentrator incorporates diffractive structures.

Regarding claim 5, Chalmers describes the conductive tracks (34) are made of metal. (See col. 3 lines 30-34).

Regarding claim 9, as seen in Figures 2 and 3, Chalmers discloses the photovoltaic conversion layer (of n-type 28 and p-type 26) being isotropic over an area which is greater than the area occupied by two light concentrating units.

Regarding claim 10, as seen in Figures 2 and 3, light travels through concentrating units (38) is bent or changed direction to avoid finger-like electrode 34, therefore the concentrating units incorporate refractive structures.

Regarding claim 12, it has been known that as light passes from air to a transparent material with different refractive index, a fraction of the light reflected from the surface. A reference of Hawley Cartwright Charles et al. (US Patent 2207656, col. 1 lines 50-55 bridging col. 2 line 1) is used herein to support this concept. It is the Examiner's position that the transparent materials disclosed by Chalmers, see col. 3 lines 56-68, in use for layer 38 have different refractive indices than air, therefore the light concentrating units (38) incorporate reflective structures.

Regarding claim 13, Chalmers discloses conductive tracks (or fingers 34) are connected to bus 36 to form a conductive network. (See Figure 2)

Regarding claim 14, Chalmers teaches that the width of the conductive tracks (or individual fingers 34) needs not to be constant along their lengths. (See col. 8 lines 49-55). In other words, the width of the conductive tracks is varied across the device.

Regarding claim 15, Chalmers describes the degree of concentration provided by each of the one or more light concentrating units corresponds to the width of the conductive tracks surrounding the region illuminated by the corresponding light concentrator. (See Figure 3 and col. 4 lines 39-61)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2-3 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chalmers (US Patent 4379202) in view of Glatfelter (US Patent 5228926).

Regarding claims 2-3 and 16, Chalmers discloses a photovoltaic device comprising a photovoltaic layer of (including layers of n-type 28 and p-type 26), a first electrode (24), a second electrode (34) and a light concentrator (38) as described in claim 1.

Chalmers does not teach that the second electrode comprising a transparent conductive layer in electrical communication with the conductive tracks, nor does he

teach a contact area for each of and in electrical communication with the first and second electrodes for connection to an external circuit.

Glatfelter et al. disclose a second electrode comprising a transparent conductive layer 14 made of indium tin oxide in electrical communication the conductive tracks. (See Figure 2 and col. 6 lines 3-14)

Glatfelter et al. also teach providing a contact area (or output terminal 46, 48) for each of and in electrical communication with the first and second electrodes for connection to an external circuit. (See Figure 4 and col. 7 lines 41-60).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Chalmers by utilizing a second electrode comprising a transparent conductive layer such as metal oxide, because it would allow the light to pass through. (See col. 5 lines 29-31).

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Chalmers by providing a contact area for each of the first and second electrodes as taught by Glatfelter et al., because it would provide an interconnection for smaller area photovoltaic cells into a large area module to increase power output. (See col. 7 lines 41-44).

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chalmers (US Patent 4379202) in view of Glatfelter et al. (US Patent 5228926) and further in view of Nakamura (US Patent 6291763).

Regarding claim 4, Chalmers and Glatfelter et al. disclose a photovoltaic device with transparent conductive layer as described in claim 2.

Neither Chalmers nor Glatfelter et al. teach that the transparent conductive layer incorporates a conductive polymer.

Nakamura teaches that a conductive polymer such as polythiophene can be incorporated with a transparent conductive layer. (See col. 27 lines 37-65 bridging col. 28 lines 1-21 and col. 28 lines 55-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of combination of Chalmers and Glatfelter et al. by incorporating conductive polymer to the transparent conductive layer as taught by Nakamura, because it would improve electrical conduction. (See col. 14 lines 66-67 bridging col. 15 lines 1-5)

4. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chalmers (US Patent 4379202) in view of Nakamura (US Patent 6291763).

Regarding claim 6, Chalmers discloses a photovoltaic device as described in claim 1.

Chalmers does not teach that the conductive tracks are made of a carbon-based material.

Nakamura teaches using carbon-base material as an electron-conductive layer. (See col. 15 lines 1-16).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Chalmers by making the conductive track of carbon-based material as taught by Nakamura because it would increase improve electron mobility. (See col. 15 lines 9-16)

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chalmers (US Patent 4379202) in view of Glatfelter et al. (US Patent 5228926).

Regarding claim 7, Chalmers discloses a photovoltaic device, wherein the conductive tracks are made of metal.

Chalmers does not teach that metal is material selected from gold, aluminum, nickel, copper, chromium, silver or alloys.

Glatfelter et al. teach using pure gold, silver and copper. (See col. 2 lines 13-16).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Chalmers by using metal of pure gold, silver or copper as taught by Glatfelter et al., because it would provide high conductivity. (See col. 2 lines 13-16)

6. Claims 1-3, 5, 7, 9-10 and 12-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glatfelter et al. (US Patent 5228926) in view of Chalmers (US Patent 4379202).

Regarding claims 1 and 5, as seen in Figure 2, Glatfelter et al. disclose a photovoltaic device, comprising a photovoltaic conversion layer (12) formed from

photoactive material (See col. 5 lines 47-68); a first electrode (10) arranged on a first surface of the photovoltaic conversion layer; a second electrode (14) comprising one or more conductive tracks (gridlines 16) arranged on the opposite second surface of the photovoltaic conversion layer to receive generated photoelectrons from the photovoltaic conversion layer, wherein the conductive tracks are made of metal (col. 6 lines 7-10); and a light concentrator (18) adjacent to the second electrode wherein the one or more conductive tracks are arranged in registration with the light concentrator such that incident light is guided substantially through gaps between the one or more conductive tracks. (See Figure 2 and the light paths depicted on Figure 2). It is the Examiner's position that a similarly shaped segment (or a repeated pattern) of the concentrator (18) is a concentrating unit. As seen in Figure 2, light rays (20) is bent around the grid lines (16), or the conductive tracks, as passing through the concentrator (18'), therefore it is the Examiner's position that the concentrating units incorporate diffractive structures.

Glatfelter et al. do not teach the light concentrator comprises a transparent support layer.

Chalmers teaches a support layer (44) made of transparent material. (See Figure 2 and col. 4 lines 29-38).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify to device of Glatfelter et al. by using a transparent support layer as taught by Chalmers, because it would allow light getting to the photovoltaic conversion layer and at the same time holding the layers together. (See col. 4 lines 29-38 of Chalmers).

Regarding claims 2-3, Glatfelter et al. disclose the second electrode 14 comprising a transparent conductive layer of indium-tin oxide, or metal oxide, in electrical communication with the conductive track 16. (See Figure 2 and col. 6 lines 3-14).

Regarding claim 7, Glatfelter et al. do not explicitly disclose in their invention that metal is a material selected from gold, aluminum, nickel, copper, chromium, silver and alloys. However, Glatfelter et al. discuss a prior art using pure gold, silver and copper. (See col. 2 lines 13-16). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Glatfelter et al. by using metal of pure gold, silver, because it would provide high conductivity. (See col. 2 lines 13-16)

Regarding claim 9, Glatfelter et al. disclose the photovoltaic conversion layer is isotropic over an area which is greater than the area occupied by two light concentrating units. (See Figure 5 and col. 12-22)

Regarding to claims 10 and 12, Glatfelter et al. describe the layer 18 deflecting light as seen in Figure 2, and being made of different material than air (col. 4 lines 14-29). Deflecting light is a characteristic of refractive and diffractive structures. Further, as light passes from air to a transparent material having a refractive index that is different than that of air, conversely the surface of transparent material reflects a fraction of light, as supported by Hawley Cartwright Charles et al. (US Patent 2207656, col. 1 lines 50-

55 bridging col. 2 line 1). Therefore, the transparent layer 18 of Glatfelter et al. incorporates refractive and reflective structures.

Regarding claim 13, Glatfelter et al. disclose the conductive tracks 34 connecting to a bus bar 42 to form a conductive network. (See Figure 4 and col. 7 lines 46-60)

Regarding claim 14, Chalmers teaches the width of the conductive tracks needs not to be constant along the length. In other words, the width can be varied across the surface. (See col. 8 lines 49-55). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify to device of Glatfelter et al. by varying the width across the surface as taught by Chalmers, because it would give a variation in the structure. (See col. 8 lines 49-55).

Regarding claim 15, Glatfelter et al. disclose the degree of concentration provided by each of the one or more light concentrating units corresponds to the width of the conductive tracks surrounding the region illuminated by the corresponding light concentrator. (See Figure 2 and col. 6 lines 39-60)

Regarding claim 16, Glatfelter et al. disclose a contact area (terminal output 46, 48) for each of and in electrical communication with the first and second electrodes fro connection to an external circuit. (See col.7 lines 41-60).

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glatfelter et al. (US Patent 5228926) and in of Chalmers (US Patent 4379202) and further in view of Nakamura (US Patent 6291763).

Regarding claim 4, Glatfelter et al. and Chalmers disclose a photovoltaic device with transparent conductive layer as described in claim 2.

Neither Glatfelter et al. nor Chalmers teach that the transparent conductive layer incorporates a conductive polymer.

Nakamura teaches that a conductive polymer such as polythiophene can be incorporated with a transparent conductive layer. (See col. 27 lines 37-65 bridging col. 28 lines 1-21 and col. 28 lines 55-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Glatfelter et al. and Chalmers by incorporating conductive polymer to the transparent conductive layer as taught by Nakamura, because it would improve electrical conduction. (See col. 14 lines 66-67 bridging col. 15 lines 1-5)

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Glatfelter et al. (US Patent 5228926) in view of Chalmers (US Patent 4379202) and further in view of Nakamura (US Patent 6291763).

Regarding claim 6, Glatfelter et al. and Chalmers disclose a photovoltaic device as described in claim 1.

Neither Glatfelter et al. and Chalmers teach that the conductive tracks are made of a carbon-based material.

Nakamura teaches using carbon-base material as an electron-conductive layer. (See col. 15 lines 1-16).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Glatfelter et al. and Chalmers by making the conductive track of carbon-based material as taught by Nakamura because it would increase improve electron mobility. (See col. 15 lines 9-16)

Response to Arguments

Applicant's arguments filed 8/13/2007 have been fully considered but they are not persuasive.

Applicant argues that the reference to Chalmers does not teach one or more light concentrating units incorporating diffractive structures. The Examiner respectfully disagrees. As seen in Figures 2-5, Chalmers clearly describes that light 32a is bent around the conductive tracks (34) as passing through the concentrator (38). Therefore the reference to Chalmers does teach one or more light concentrating units incorporating diffractive structures.

Applicant also argues that Glatfelter et al. do not disclose or suggest a light concentrator comprising one or more light concentrating units incorporating diffractive structures. The Examiner respectfully disagrees. As seen in Figure 2, Glatfelter et al. describe the light arrays (20) is bent around the gridlines (16) as passing through the ling concentrator (18'). Therefore Glatfelter et al. do teach one or more light concentrating units incorporating diffractive structures.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT
10/24/2007

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700